



## TFT LCD Approval Specification

# MODEL NO.: N154I1-L06

# Toshiba Model Name: G33C0002T110

### NOTICE of RECEIPT

We accepted this specification. **OME Operations, TOSHIBA Corp.**

|                         |      |            |            |
|-------------------------|------|------------|------------|
| Purchasing<br>dept.     | Eng. | Senr. Eng. | Senr. Mgr. |
|                         |      |            |            |
| PC<br>Hardware<br>dept. | Eng. | Senr. Eng. | Senr. Mgr. |
|                         |      |            |            |

| Liquid Crystal Display Division                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| QRA Division.                                                                       | OA Head Division.                                                                   |
| Approval                                                                            | Approval                                                                            |
|  |  |



**CONTENTS****REVISION HISTORY****GENERAL DESCRIPTION****1. ABSOLUTE MAXIMUM RATINGS**

- 1.1 ABSOLUTE RATING OF ENVIRONMENT
- 1.2 ELECTRICAL ABSOLUTE RATINGS
- 1.3 MECHANICAL RATINGS
- 1.4 THE OTHERS

**2. ELECTRICAL SPECIFICATIONS**

- 2.1 TFT LCD MODULE
- 2.2 BACKLIGHT UNIT
- 2.3 MATERIAL LIST CONCERNING EMI REGULATIONS

**3. INTERFACE SPECIFICATIONS**

- 3.1 THE PIN ASSIGNMENT OF LVDS INTERFACE CONNECTOR
- 3.2 INPUT SIGNAL TIMING SPECIFICATIONS
- 3.3 COLOR DATA INPUT ASSIGNMENT
- 3.4 POWER UP/DOWN SEQUENCE

**4. OPTICAL SPECIFICATIONS**

- 4.1 TEST CONDITIONS
- 4.2 OPTICAL SPECIFICATIONS

**5. MECHANICAL DRAWING****6. PRECAUTION**

- 6.1 ASSEMBLY AND HANDLING PRECAUTION
- 6.2 SAFTY PRECAUTION

**7. PACKING**

- 7.1 PACKING SPECIFICATIONS
- 7.2 PACKING METHOD

**8. DEFINITION OF SHIPPING LABEL ON MODULE**

Attached 1, Outline Drawing

**REVISION HISTORY**

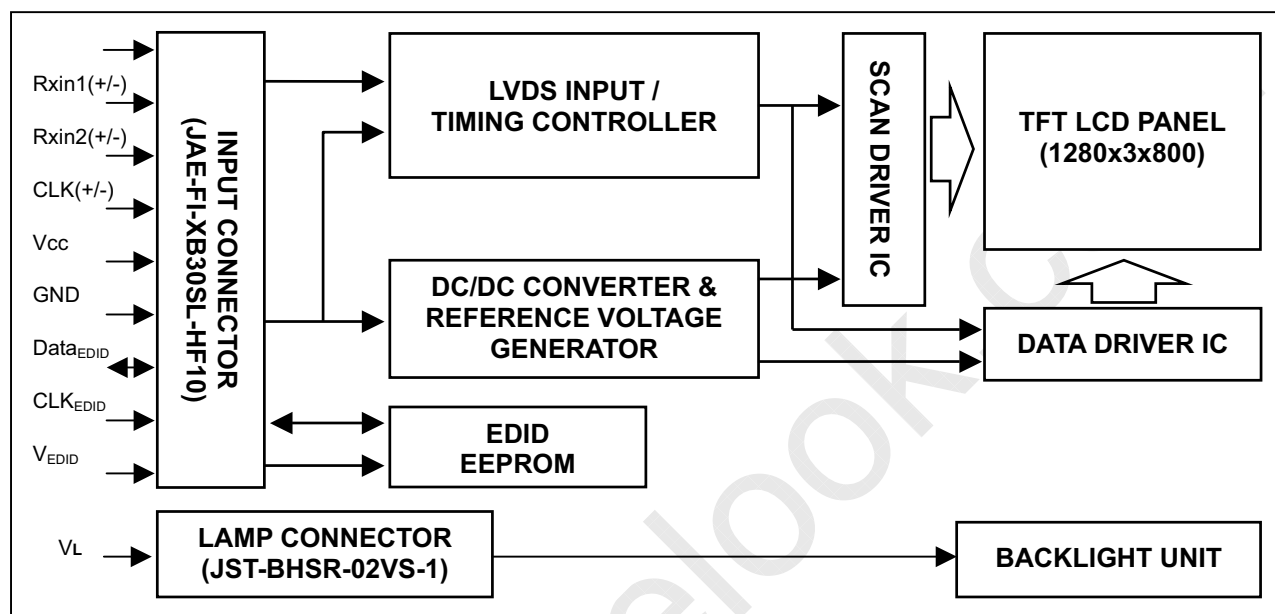
| Version | Date        | Page<br>(New) | Section | Description                                            |
|---------|-------------|---------------|---------|--------------------------------------------------------|
| Ver 3.0 | Mar. 24,'05 | All           | All     | Approval Specification was first issued.               |
| Ver 3.1 | Apr. 20,'05 | 9             | 2.2     | Modify Startup Voltage from 1530(0 °C) to 1400 (0 °C). |
|         |             | 15            | 3.4.1   | Modify t6 from 200ms to 0ms.                           |
|         |             | 26            |         | Modify total length of lamp wire to 94 +/- 5mm.        |

## GENERAL DESCRIPTION

### OVERVIEW

This is a 15.4" TFT Liquid Crystal Display module with single CCFL Backlight unit and 30 pins LVDS interface. This module supports 1280 x 800 WXGA mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is not built in.

### BLOCK DIAGRAM



### APPLICATION

-Note Book PC

### GENERAL SPECIFICATIONS

| Item                   | Specifications          | Unit  |
|------------------------|-------------------------|-------|
| Screen Size            | 15.4 Diagonal           | inch  |
| Bezel opening area     | 335.0 (H) x 210.7 (V)   | mm    |
| Effective display area | 331.2 (H) x 207.0 (V)   | mm    |
| Pixel number           | 1280 x R.G.B x 800      | pixel |
| Pixel pitch            | 0.2588 (H) x 0.2588 (V) | mm    |
| Pixel Arrangement      | R.G.B Vertical Stripe   | -     |
| Display Color          | 6 bits, 262,144         | color |
| Transmissive mode      | Normally white          | -     |
| Surface treatments     | Hardness (2H), Glare    | -     |

### MECHANICAL SPECIFICATIONS

| ITEM        |            | MIN.  | TYP.  | MAX.  | Unit | Note |
|-------------|------------|-------|-------|-------|------|------|
| Module Size | Horizontal | 343.5 | 344.0 | 344.5 | mm   | -    |
|             | Vertical   | 221.5 | 222.0 | 222.5 | mm   | -    |
|             | Depth      | -     | 6.2   | 6.5   | mm   | (1)  |
| Weight      |            | -     | 600   | 620   | g    | -    |

Note 1: The maximum thickness of I/O connector area is 6.5mm.

## 1. ABSOLUTE MAXIMUM RATINGS

### 1.1 ABSOLUTE RATING OF ENVIRONMENT

| Item                            | Symbol           | Min. | Max.  | Unit | Note          |
|---------------------------------|------------------|------|-------|------|---------------|
| Operating Ambient Temperature   | T <sub>OP</sub>  | 0    | +50   | °C   | -             |
| Operating Temperature for Panel | -                | 0    | +60   | °C   | (2)           |
| Storage Temperature             | T <sub>STG</sub> | -20  | +60   | °C   | -             |
| Operating Ambient Humidity      | H <sub>OP</sub>  | 20   | 90    | %RH  | (1)           |
| Storage Humidity                | H <sub>STG</sub> | 10   | 90    | %RH  | (1)           |
| Air Pressure                    | -                | 70.0 | -     | kPa  | Operation     |
| Air Pressure                    | -                | 12.0 | -     | kPa  | Non-Operation |
| Altitude                        | -                | -    | 4572  | m    | Operation     |
| Altitude                        | -                | -    | 15240 | m    | Non-Operation |

Note. (1) Wet bulb temperature should be 39°C Max, and no condensation of water.

(2) The surface temperature caused by self-heat radiation of cell itself is specified on this item.

### 1.2 ELECTRICAL ABSOLUTE RATINGS

#### (1) TFT LCD Module

| Parameter            | Symbol          | Values |                      | Unit | Remarks   |
|----------------------|-----------------|--------|----------------------|------|-----------|
|                      |                 | Min.   | Max.                 |      |           |
| Power supply voltage | V <sub>CC</sub> | -0.3   | +4.0                 | V    | Ta=0~50°C |
| Logic input voltage  | V <sub>IN</sub> | -0.3   | V <sub>CC</sub> +0.3 | V    |           |

#### (2) Backlight Unit

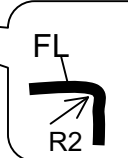
| Parameter      | Symbol         | Values |      | Unit              | Remarks  |
|----------------|----------------|--------|------|-------------------|----------|
|                |                | Min.   | Max. |                   |          |
| Lamp voltage   | V <sub>L</sub> | -      | 2.5K | V <sub>rms</sub>  | Note (1) |
| Lamp current   | I <sub>L</sub> | 3.0    | 6.5  | mA <sub>rms</sub> | -        |
| Lamp frequency | f <sub>L</sub> | -      | 80   | kHz               | -        |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.



### 1.3 MECHANICAL RATINGS

LCD shall have no failure in the following reliability items.

| Item                                    | Test Conditions                                                                                                                |                                                                                                         | Note                                                                                                  |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Mechanical Vibration                    | Frequency Range 5 – 500 Hz, 14.7m/s <sup>2</sup> ( 1.5G) constant, 0.5Hrs each axis (X, Y, Z direction)                        |                                                                                                         | Non Operation                                                                                         |
|                                         | Frequency Range 5 – 500 Hz, 4.9m/s <sup>2</sup> ( 0.5G) constant, 0.5Hrs each axis (X, Y, Z direction)                         |                                                                                                         | Operation                                                                                             |
| Mechanical Shock                        | 2548m/s <sup>2</sup> (260G), Pulse width 2ms, Half-Sine Wave, ±X, ±Y, ±Z direction, each 1 time                                |                                                                                                         | Operation & Non Operation                                                                             |
|                                         | 686m/s <sup>2</sup> (70G), Pulse width 11 ms, Half-Sine Wave, ±X, ±Y, ±Z direction, each 3 times.                              |                                                                                                         | Non Operation                                                                                         |
| Pressure Resistance                     | No Destruction with the force 196 N (20 kgf, 16 mm in diameter) to the display surface at the vertical direction               |                                                                                                         | Non Operation<br>Fig 1-3-1                                                                            |
|                                         | No Destruction with the force 294.2 N (30 kgf, 30 mm in diameter) to the back of the display surface at the vertical direction |                                                                                                         | Fig 1-3-2<br>Fig 1-3-3                                                                                |
| Strength of FL Cable                    | Strength of rotation force                                                                                                     | Cable : No disconnection of cable to the 5 trial of 360 degree rotation.<br>See a bent state of cable.  | Non Operation<br> |
|                                         |                                                                                                                                | Connector : No disconnection of cable to 10 trial of 180 degree rotation.<br>See a bent state of cable. |                                                                                                       |
|                                         | Lead pull test                                                                                                                 | Soldering portion : 14.7N (1.5kgf), 1min                                                                |                                                                                                       |
|                                         |                                                                                                                                | Connector : 14.7N (1.5kgf), 1 sec                                                                       |                                                                                                       |
| Connector tension test                  | Input connector : With 50 times of connector trial there must be no damage to the shape and functional.                        |                                                                                                         | Non Operation                                                                                         |
|                                         | Back light connector : With 50 times of connector trial there must be no damage to the shape and functional.                   |                                                                                                         |                                                                                                       |
| Assured torque value at side-mount part | 245 mN·m (2.5 kgf·cm)                                                                                                          |                                                                                                         | Non Operation                                                                                         |
| Rescrewed test                          | 10 times under 245.0 mN·m (2.5 kgf·cm)                                                                                         |                                                                                                         | Non Operation                                                                                         |
| Tapping test                            | Test “ Ripple “ Phenomenon.                                                                                                    |                                                                                                         | Operation                                                                                             |

Definitions of failure for judgment shall be as follows:

- 1) Function of the module should be maintained.
- 2) Current consumption should be smaller than the specified value.
- 3) Appearance and display quality should not have distinguished degradation.
- 4) Luminance should be larger than the minimum value specified in optical specification.

## NOTE

## (1) The compression condition of front side

- (a) Compression point : 12 points ( refer to Fig 1-3-1)
- (b) Compression condition: Time 3 sec, Tool diameter: 16 mm in diameter (refer to Fig 1-3-3)

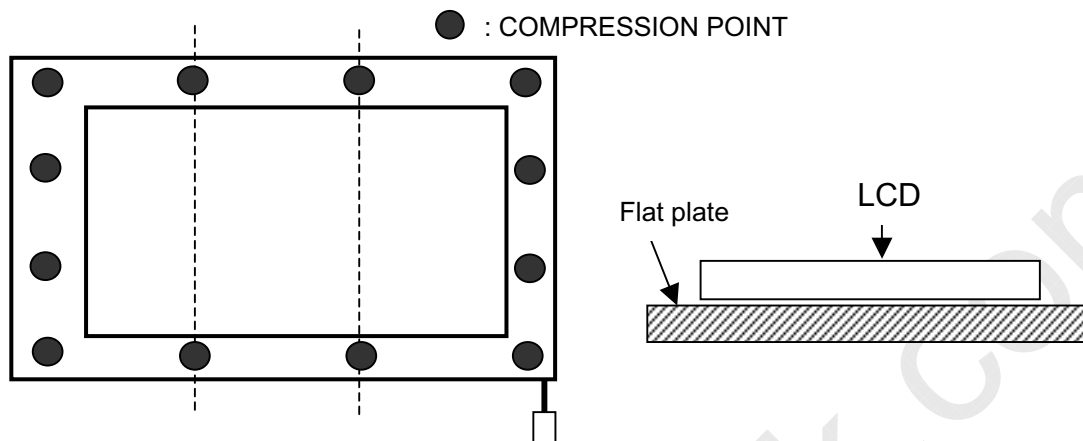


Fig 1-3-1

## (2) The compression condition of rear side

- (a) Compression point : 21 points ( refer to Fig 1-3-2 )
- (b) Compression condition : Time 3 sec, Tool radius: 30 mm in diameter ( refer to Fig 1-3-3)

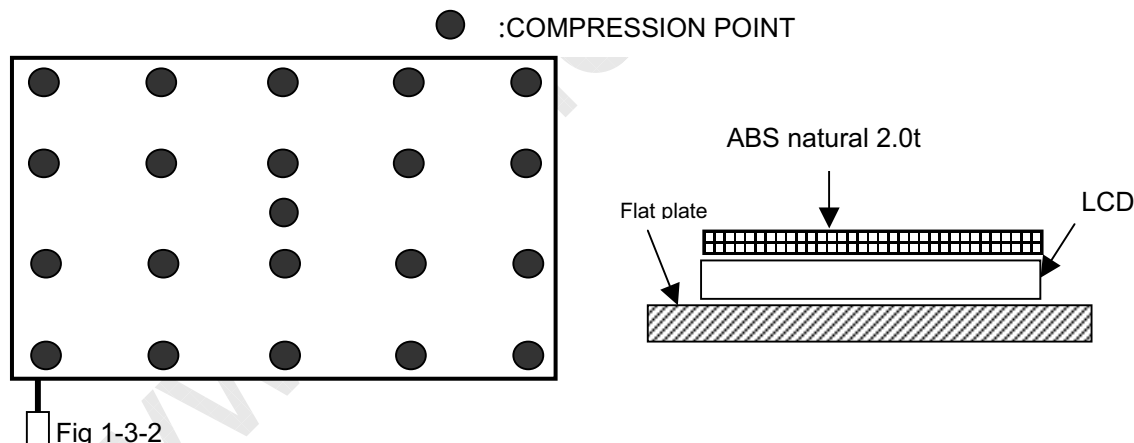


Fig 1-3-2

## (3) Dimension of the compression jig

- (a) compression jig for front side A = 16 mm in diameter  
       B = 16 mm in diameter
- (b) compression jig for rear side A = 30 mm in diameter  
       B = 28 mm in diameter

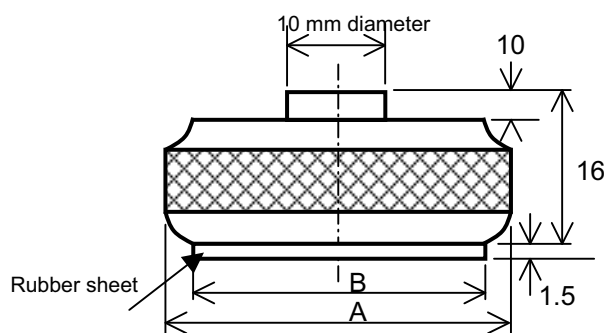


Fig 1-3-3



## 1.4 THE OTHERS

### (1) Static electricity pressure resistance

| Items             | Testing conditions | Operation | Non Operation |
|-------------------|--------------------|-----------|---------------|
| Contact discharge | 150pF, 330 ohm     | ±10 kV    | ±10 kV        |
| Air discharge     | 150pF, 330 ohm     | ±20 kV    | ±20 kV        |

### ESD Acceptance Definition:

Temporary performance degradation. Recovery by operator is acceptable. No hardware failure.

### (2) Sound noise

There should be no uncomfortable noise.

Being used under whatever surrounds, when power on/off, the panel should not generate uncomfortable noise.

### (3) Open / Short

No smoke, no fire at any open/ short test

### (4) MTBF : 50000 Hr (except for backlight lamp)



## 2. ELECTRICAL SPECIFICATIONS

### 2.1 TFT LCD MODULE

| MODULE                      |            |          |      |      |      |       |
|-----------------------------|------------|----------|------|------|------|-------|
| Parameter                   | Symbol     | Value    |      |      | Unit | Notes |
|                             |            | Min.     | Typ. | Max. |      |       |
| Power Supply Voltage        | $V_{CC}$   | 3.0      | 3.3  | 3.6  | V    | (1)   |
| "H" level LVDS signal input | $V_{IH}$   | -        | -    | +100 | mV   |       |
| "L" level LVDS signal input | $V_{IL}$   | -100     | -    | -    | mV   |       |
| Power Supply Current        | White      | $I_{CC}$ | 350  | 400  | 450  | mA    |
|                             | Black      |          | 470  | 520  | 570  |       |
|                             | Maximum    |          | 510  | 560  | 610  |       |
| Rush Current                | $I_{RUSH}$ | -        | 1.0  | 1.5  | A    | (2)   |
| Ripple voltage              | $V_{RP}$   | -        | -    | 100  | mV   | (1)   |
| Terminating resistor        | $R_t$      | -        | 100  | -    | Ohm  |       |

LCD Fuse name: Kamaya(manufacturer)

### 2.2 BACKLIGHT UNIT

LAMP : Harison, MBTM2JB418AX337MWLFH/C-FH

| BACKLIGHT ( 1 Lamp) |          |       |       |            |           |                  |
|---------------------|----------|-------|-------|------------|-----------|------------------|
| Parameter           | Symbol   | Value |       |            | Unit      | Notes            |
|                     |          | Min.  | Typ.  | Max.       |           |                  |
| Lamp Voltage        | $V_L$    | 585   | 650   | 715        | $V_{RMS}$ | $I_L=6.0mA$      |
| Lamp Current        | $I_L$    | 3.0   | 6.0   | 6.5        | mA        | (3)              |
| Startup Voltage     | $V_S$    | -     | -     | 1230(25°C) | $V_{RMS}$ | (4)              |
|                     |          | -     | -     | 1400 (0°C) | $V_{RMS}$ | (4)              |
| Operating Frequency | $F_L$    | 50    | -     | 80         | KHz       | (5)              |
| Power Consumption   | $P_L$    | -     | 3.9   | -          | W         | (6), $I_L=6.0mA$ |
| Lamp Life time      | $L_{BL}$ | 10000 | 15000 | -          | Hrs       | (7)              |

The connector information of Black light unit.

| Pin | Symbol | Description      | Remark |
|-----|--------|------------------|--------|
| 1   | HV     | Lamp power input | Pink   |
| 2   | LV     | Ground           | Black  |

Connector Part No.: BHTR-02VS

User's connector Part No.: SM02B-BHTS-B-TB

### 2.3 MATERIAL LIST CONCERNING EMI REGULATIONS

(1) EMI Regulations:

"N154I1\_L06" which is assembled inside Toshiba's Satellite model should be met to the regulations as below:

CISPR: Pub.22 Class B

FCC : Part 15 Class B

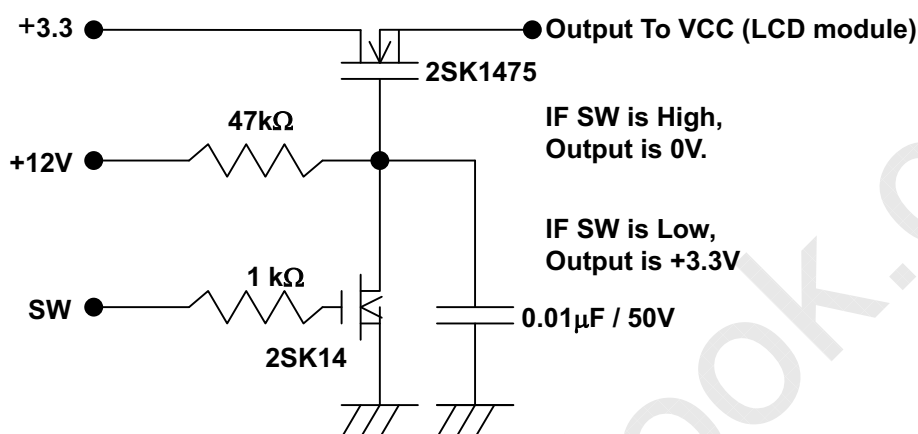
VCCI : Class B

(2) Safety regulation (CMO TFT-LCD module only): UL 1950

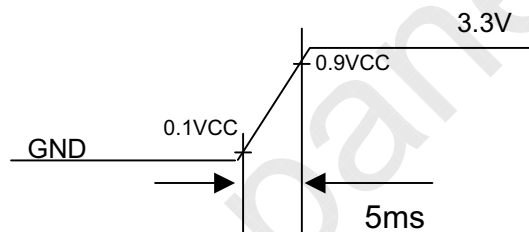
| 1. EMI Filter      | Silk                           | Product Code | Rating | Maker            |
|--------------------|--------------------------------|--------------|--------|------------------|
| Bead               | N/A                            | N/A          |        | Sumida           |
| Chip Resistor      | (L1,L2,L3,L4,L5L8,L10,L11,R63) | N/A          | 0 Ohm  |                  |
| 2. DC/DC Converter | Silk                           | Osc. Freq.   |        | Maker            |
| PWM IC             | U3                             | Typ 640 KHz. |        | Maxim Technology |

Note (1) Operating Temp. range is 0 ~ 50 °C

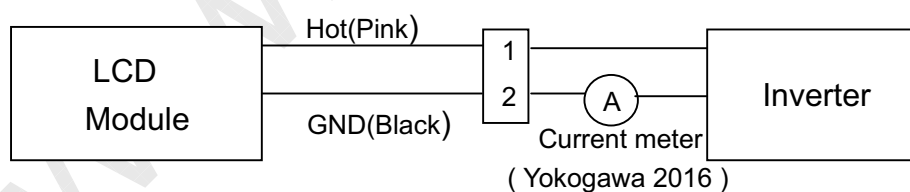
Note (2) Measurement Conditions



VCC rising time is 5ms



Note (3) Lamp current is measured by utilizing a current meter for high frequency as shown below:



Note (4) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (5) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (6)  $P_L = I_L \times V_L$ .

Note (7) The lifetime (Hr) of a lamp can be defined as the time in which it continues to operate under the condition  $T_a = 25 \pm 2^\circ\text{C}$  and  $I_L = 6.0 \text{ mA}$  until one of the following event occurs :

- (1) When the brightness becomes 50% or lower than its original,
  - (2) When the effective ignition length becomes 80% or lower than its original value.
- (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (8) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be designed with care so as not to produce too much current leakage from high-voltage output of the inverter. When designing or ordering the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occurs. When the above situation is confirmed, the module should be operated in the same manners as it is installed in your instrument.

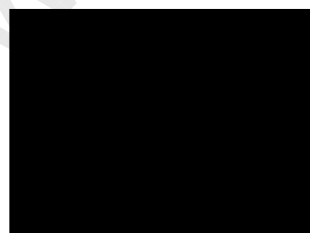
Note (9) Vcc drop voltage that caused by rush current when sw-on ( refer to Note(2) test circuit ) is max.=0.5V

Note (10) The specified power supply current is under the conditions,  $T_a = 25 \pm 2^\circ\text{C}$ ,  $f_v = 60 \text{ Hz}$ , whereas a power dissipation check pattern below is displayed. The maximum value is measured when  $V_{CC}=3.0\text{V}$ , the typical value is measured when  $V_{CC}=3.3\text{V}$  and the minimum value is measured when  $V_{CC}=3.6\text{V}$ .

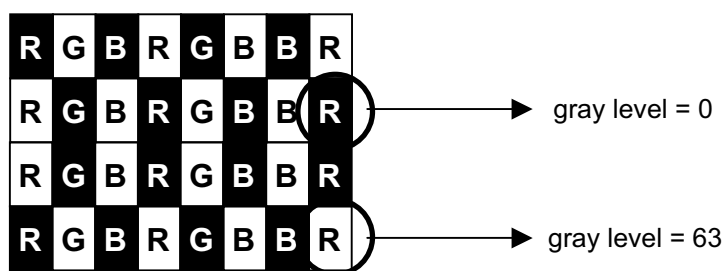
a. White Pattern



b. Black Pattern



c. Maximum pattern (Zoom in)



• • • expend to whole active area

### 3. INTERFACE SPECIFICATIONS

#### 3.1 THE PIN ASSIGNMENT OF LVDS INTERFACE CONNECTOR.

| Pin | Symbol               | Description                   | Polarity | Remark               |
|-----|----------------------|-------------------------------|----------|----------------------|
| 1   | Vss                  | Ground                        |          |                      |
| 2   | Vcc                  | Power Supply +3.3 V (typical) |          |                      |
| 3   | Vcc                  | Power Supply +3.3 V (typical) |          |                      |
| 4   | V <sub>EDID</sub>    | DDC 3.3V Power                |          | DDC 3.3V Power       |
| 5   | NC                   | Non-Connection                |          |                      |
| 6   | CLK <sub>EDID</sub>  | DDC Clock                     |          | DDC Clock            |
| 7   | DATA <sub>EDID</sub> | DDC Data                      |          | DDC Data             |
| 8   | Rxin0-               | LVDS Differential Data Input  | Negative | R0~R5,G0             |
| 9   | Rxin0+               | LVDS Differential Data Input  | Positive |                      |
| 10  | Vss                  | Ground                        |          |                      |
| 11  | Rxin1-               | LVDS Differential Data Input  | Negative | G1~G5,B0,B1          |
| 12  | Rxin1+               | LVDS Differential Data Input  | Positive |                      |
| 13  | Vss                  | Ground                        |          |                      |
| 14  | Rxin2-               | LVDS Differential Data Input  | Negative | B2~B5,DE,Hsync,Vsync |
| 15  | Rxin2+               | LVDS Differential Data Input  | Positive |                      |
| 16  | Vss                  | Ground                        |          |                      |
| 17  | CLK-                 | LVDS Clock Data Input         | Negative | LVDS Level Clock     |
| 18  | CLK+                 | LVDS Clock Data Input         | Positive |                      |
| 19  | Vss                  | Ground                        |          |                      |
| 20  | NC                   | Non-Connection                |          |                      |
| 21  | NC                   | Non-Connection                |          |                      |
| 22  | NC                   | Non-Connection                |          |                      |
| 23  | NC                   | Non-Connection                |          |                      |
| 24  | NC                   | Non-Connection                |          |                      |
| 25  | NC                   | Non-Connection                |          |                      |
| 26  | NC                   | Non-Connection                |          |                      |
| 27  | NC                   | Non-Connection                |          |                      |
| 28  | NC                   | Non-Connection                |          |                      |
| 29  | NC                   | Non-Connection                |          |                      |
| 30  | NC                   | Non-Connection                |          |                      |

Note (1) The first pixel is even.

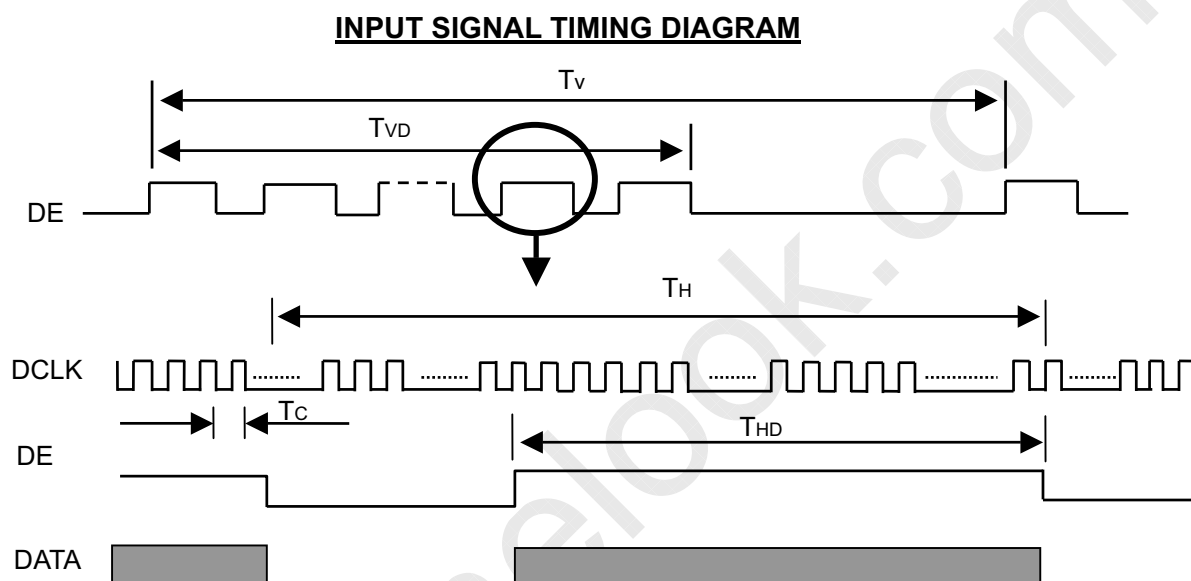
Note (2) Connector Part No.: JAE-FI-XB30SL-HF10

Note (3) User's connector Part No: JAE-FI-X30C2L

### 3.2 INPUT SIGNAL TIMING SPECIFICATIONS

The specifications of input signal timing are as the following table and timing diagram.

| Signal | Item                       | Symbol           | Min. | Typ. | Max. | Unit           | Note |
|--------|----------------------------|------------------|------|------|------|----------------|------|
| DCLK   | Frequency                  | 1/T <sub>c</sub> | 50   | 71   | 80   | MHz            | -    |
| DE     | Vertical Total Time        | T <sub>V</sub>   | 810  | 823  | 2000 | TH             | -    |
|        | Vertical Addressing Time   | T <sub>VD</sub>  | 800  | 800  | 800  | TH             | -    |
|        | Horizontal Total Time      | T <sub>H</sub>   | 1360 | 1440 | 2000 | T <sub>c</sub> | -    |
|        | Horizontal Addressing Time | T <sub>HD</sub>  | 1280 | 1280 | 1280 | T <sub>c</sub> | -    |



### 3.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

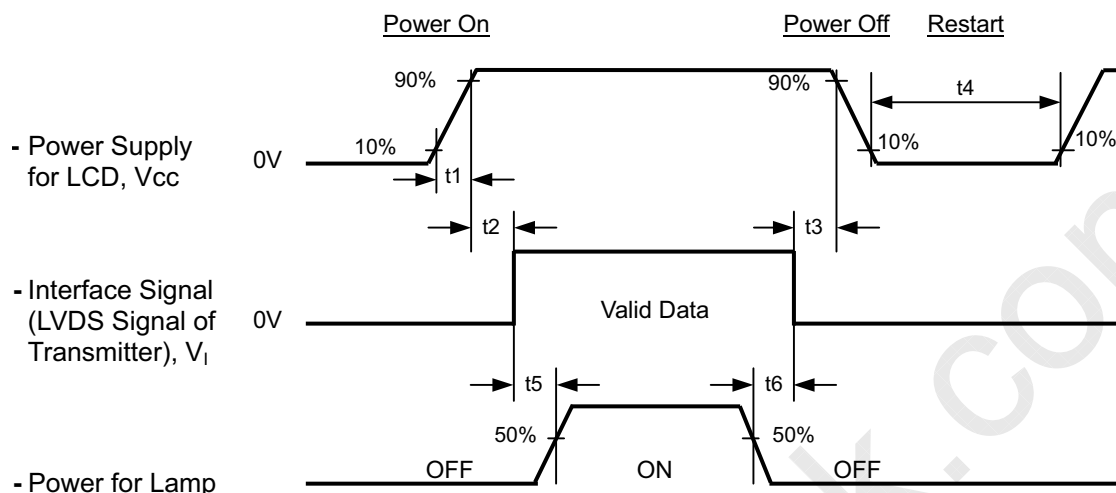
| Color               |               | Data Signal |    |    |    |    |    |       |    |    |    |    |    |      |    |    |    |    |    |
|---------------------|---------------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|----|
|                     |               | Red         |    |    |    |    |    | Green |    |    |    |    |    | Blue |    |    |    |    |    |
|                     |               | R5          | R4 | R3 | R2 | R1 | R0 | G5    | G4 | G3 | G2 | G1 | G0 | B5   | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black         | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red           | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green         | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue          | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan          | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta       | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow        | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | White         | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
| Gray Scale Of Red   | Red(0)/Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1)        | 0           | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(2)        | 0           | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Red(61)       | 1           | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(62)       | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(63)       | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Green | Green(0)/Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(1)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(2)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Green(61)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(62)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(63)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
| Gray Scale Of Blue  | Blue(0)/Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue(1)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  |
|                     | Blue(2)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 1  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Blue(61)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 0  | 1  |
|                     | Blue(62)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 0  |
|                     | Blue(63)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |

Note (1) 0: Low Level Voltage, 1: High Level Voltage



### 3.4 POWER UP/DOWN SEQUENCE & VCC DIP CONDITIONS

#### 3.4.1 POWER UP/DOWN SEQUENCE



#### Timing Specifications:

$$0.5 \leq t1 \leq 10 \text{ msec}$$

$$0 < t2 \leq 50 \text{ msec}$$

$$0 < t3 \leq 50 \text{ msec}$$

$$t4 \geq 400 \text{ msec}$$

$$t5 \geq 200 \text{ msec}$$

$$t6 \geq 0 \text{ msec}$$

Note (1) Please avoid floating state of interface signal at invalid period.

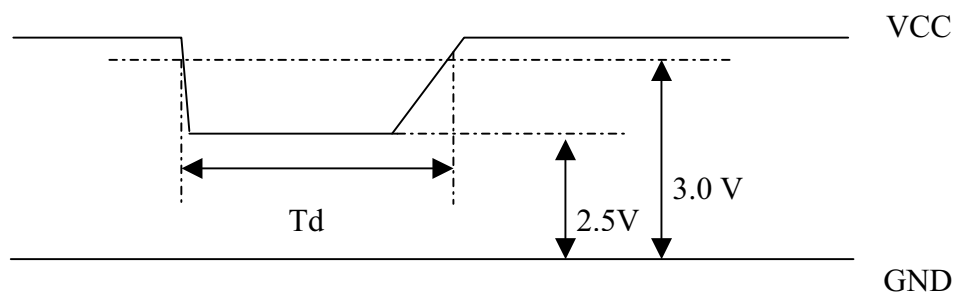
Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time had better to follow

$$t7 \geq 5 \text{ msec}$$

### 3.4.2 VCC DIP CONDITIONS



(1)  $2.5V \leq VCC < 3.0V$

$Td \leq 20 \text{ ms}$

(2)  $VCC < 2.5V$

Vcc-Dip conditions also follow the power up/down conditions for supply voltage.

## 4. OPTICAL SPECIFICATIONS

### 4.1 TEST CONDITIONS

Ambient Temperature :  $T_a = 25 \pm 2^\circ\text{C}$

Ambient Humidity :  $H_a = 50 \pm 10\% \text{RH}$

Supply Voltage :  $V_{DD} = 3.3\text{V}$

Input Signal : According to typical value in "Electrical Characteristics"

FL Input Current :  $I_{FL} = 6.0\text{mA}_{\text{rms}}$

FL Driving Frequency :  $f_{FL} = 60\text{ kHz}$

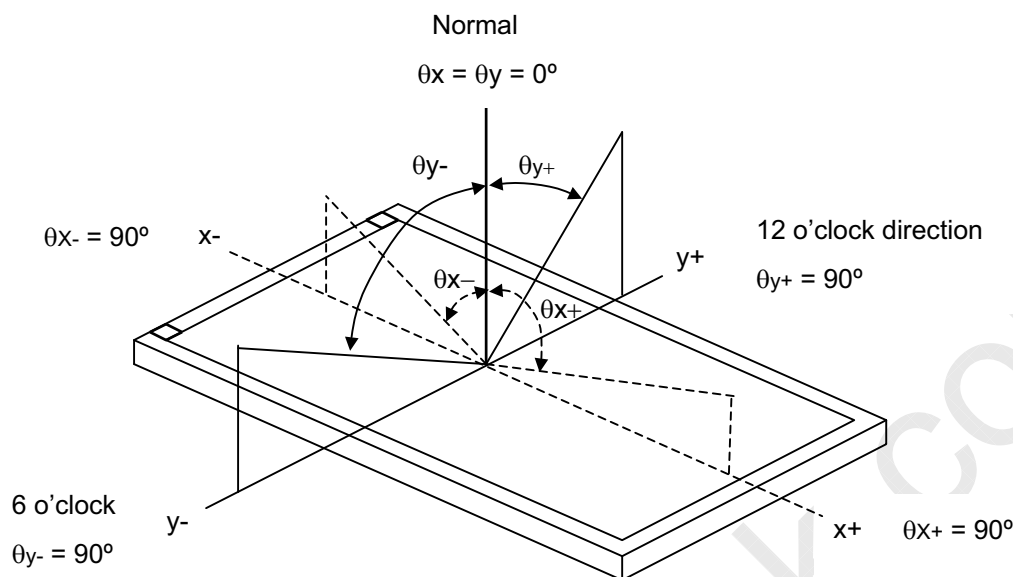
FL Inverter : H05-4783B (Sumida)

The measuring method is shown in 4.2. The following items are measured under stable conditions. The optical characteristics should be measured in a dark room ( Screen luminance  $< 2\text{-lx}$  ) or equivalent state with the methods shown in Note (6).

**4.2 OPTICAL SPECIFICATIONS**

| Item                                    |       | Symbol             | Conditions                                                  | Specifications       |               |       | Unit              | Note                                                                              |          |
|-----------------------------------------|-------|--------------------|-------------------------------------------------------------|----------------------|---------------|-------|-------------------|-----------------------------------------------------------------------------------|----------|
|                                         |       |                    |                                                             | Min.                 | Typ.          | Max.  |                   |                                                                                   |          |
| Contrast Ratio                          |       | CR <sub>AVE</sub>  | θ <sub>x</sub> = θ <sub>y</sub> =0°                         | 250                  | 350           | -     | -                 | (2),(6)                                                                           |          |
| Response Time                           |       | T <sub>R</sub>     |                                                             | -                    | 5             | 10    | ms                | (3)                                                                               |          |
|                                         |       | T <sub>F</sub>     |                                                             | -                    | 15            | 20    | ms                |                                                                                   |          |
| Average luminance of white ( 5 points ) |       | Y <sub>L,AVE</sub> |                                                             | 180                  | 200           | -     | cd/m <sup>2</sup> | I <sub>FL</sub> =6.0mA <sub>rms</sub> *<br>Gray Scale<br>Level=L63 (White)<br>(4) |          |
| Cross Modulation                        |       | D <sub>SHA</sub>   |                                                             | -                    | -             | 1.0   | %                 | (5)                                                                               |          |
| Luminance Uniformity Chromaticity       | Red   | R <sub>x</sub>     |                                                             | Viewing normal angle | Typ.<br>-0.03 | 0.593 | Typ.<br>+0.03     | -                                                                                 | (1), (6) |
|                                         |       | R <sub>y</sub>     |                                                             |                      |               | 0.331 |                   | -                                                                                 |          |
|                                         | Green | G <sub>x</sub>     |                                                             |                      |               | 0.310 |                   | -                                                                                 |          |
|                                         |       | G <sub>y</sub>     |                                                             |                      |               | 0.530 |                   | -                                                                                 |          |
|                                         | Blue  | B <sub>x</sub>     |                                                             |                      |               | 0.155 |                   | -                                                                                 |          |
|                                         |       | B <sub>y</sub>     |                                                             |                      |               | 0.129 |                   | -                                                                                 |          |
|                                         | White | W <sub>x</sub>     |                                                             |                      | 0.283         | 0.313 | 0.343             | -                                                                                 |          |
|                                         |       | W <sub>y</sub>     |                                                             |                      | 0.299         | 0.329 | 0.359             | -                                                                                 |          |
| Viewing Angle                           | Hor.  | θ <sub>x+</sub>    | Center<br>CR>=10                                            | 50                   | 60            | -     | deg.              |                                                                                   |          |
|                                         |       | θ <sub>x-</sub>    |                                                             | 50                   | 60            | -     |                   |                                                                                   |          |
|                                         | Ver.  | θ <sub>y+</sub>    |                                                             | 30                   | 40            | -     |                   |                                                                                   |          |
|                                         |       | θ <sub>y-</sub>    |                                                             | 50                   | 60            | -     |                   |                                                                                   |          |
|                                         | Hor.  | θ <sub>x+</sub>    | Center<br>CR>=5                                             | 65                   | 75            | -     |                   |                                                                                   |          |
|                                         |       | θ <sub>x-</sub>    |                                                             | 65                   | 75            | -     |                   |                                                                                   |          |
|                                         | Ver.  | θ <sub>y+</sub>    |                                                             | 45                   | 55            | -     |                   |                                                                                   |          |
|                                         |       | θ <sub>y-</sub>    |                                                             | 65                   | 75            | -     |                   |                                                                                   |          |
| 13 Points White Variation               |       | δ W                | θ <sub>x</sub> = θ <sub>y</sub> =0°<br>Viewing normal angle | -                    | 1.3           | 1.5   | -                 | (7)                                                                               |          |
| 13 Points CR Variation                  |       | δ C <sub>R</sub>   |                                                             | -                    | 2.3           | 2.7   | -                 | (7)                                                                               |          |
| White Variation                         |       | dL                 |                                                             | -                    | -             | 1.4   | %/mm              | (8)                                                                               |          |
| Gamma                                   | 63    |                    | θ <sub>x</sub> = θ <sub>y</sub> =0°<br>Viewing normal angle | 100                  | 100           | 100   | %                 | (1) (6)<br>at center of<br>Viewing area<br>center only                            |          |
|                                         | 60    |                    |                                                             | 87.5                 | 94.1          | 100.7 |                   |                                                                                   |          |
|                                         | 56    |                    |                                                             | 75.3                 | 81            | 86.7  |                   |                                                                                   |          |
|                                         | 52    |                    |                                                             | 63.5                 | 68.3          | 73.1  |                   |                                                                                   |          |
|                                         | 48    |                    |                                                             | 51.7                 | 55.6          | 59.5  |                   |                                                                                   |          |
|                                         | 44    |                    |                                                             | 42.5                 | 45.7          | 48.9  |                   |                                                                                   |          |
|                                         | 40    |                    |                                                             | 34.6                 | 37.2          | 39.8  |                   |                                                                                   |          |
|                                         | 36    |                    |                                                             | 27.8                 | 29.9          | 32    |                   |                                                                                   |          |
|                                         | 32    |                    |                                                             | 20.9                 | 22.5          | 24.1  |                   |                                                                                   |          |
|                                         | 28    |                    |                                                             | 15.3                 | 16.5          | 17.7  |                   |                                                                                   |          |
|                                         | 24    |                    |                                                             | 10.4                 | 11.2          | 12    |                   |                                                                                   |          |
|                                         | 20    |                    |                                                             | 7                    | 7.5           | 8.0   |                   |                                                                                   |          |
|                                         | 16    |                    |                                                             | 4.4                  | 4.7           | 5.0   |                   |                                                                                   |          |
|                                         | 12    |                    |                                                             | 2.8                  | 3.0           | 3.2   |                   |                                                                                   |          |
|                                         | 8     |                    |                                                             | 1.4                  | 1.5           | 1.6   |                   |                                                                                   |          |
|                                         | 4     |                    |                                                             | 0.4                  | 0.4           | 0.4   |                   |                                                                                   |          |
|                                         | 0     |                    |                                                             | 0                    | 0             | 0     |                   |                                                                                   |          |

Note (1) Definition of Viewing Angle  $\theta_x$  and  $\theta_y$  :



Note (2) Definition of Contrast Ratio :

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

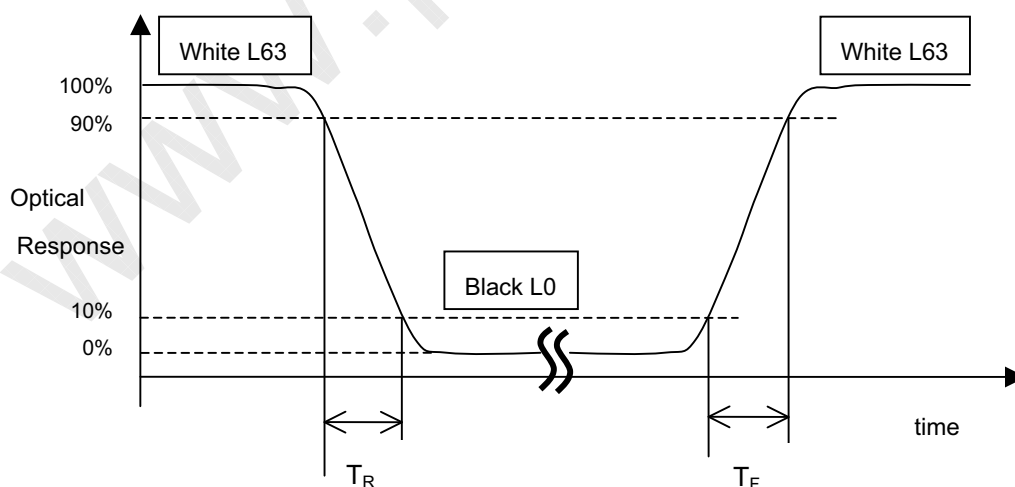
L63 : Luminance on the white raster (gray scale level L63)

L0 : Luminance on the black raster (gray scale level L0)

$$CR_{AVE} = (CR(4) + CR(5) + CR(7) + CR(9) + CR(10)) / 5$$

CR(X) is correspond to the Contrast Ratio of a point of X at Figure of Note (7).

Note (3) Definition of Response time :



Note (4) Definition of Average Luminance of White :  
 measure the luminance of white at 5 points.  
 Average Luminance of White  $Y_{L,AVE}$

$$Y_{L,AVE} = (Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}) / 5$$

$Y_{LX}$  is correspond to the Luminance of a point of X at Figure of Note (7).

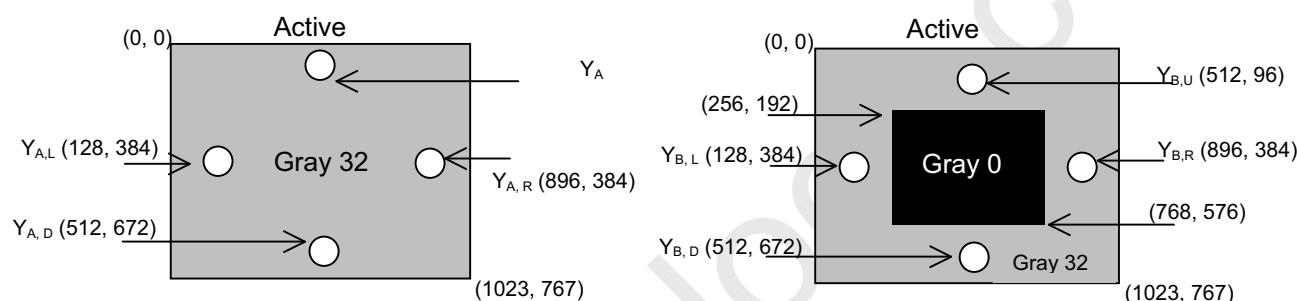
Note (5) Definition of Cross Modulation ( $D_{SHA}$ )

$$D_{SHA} = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where :

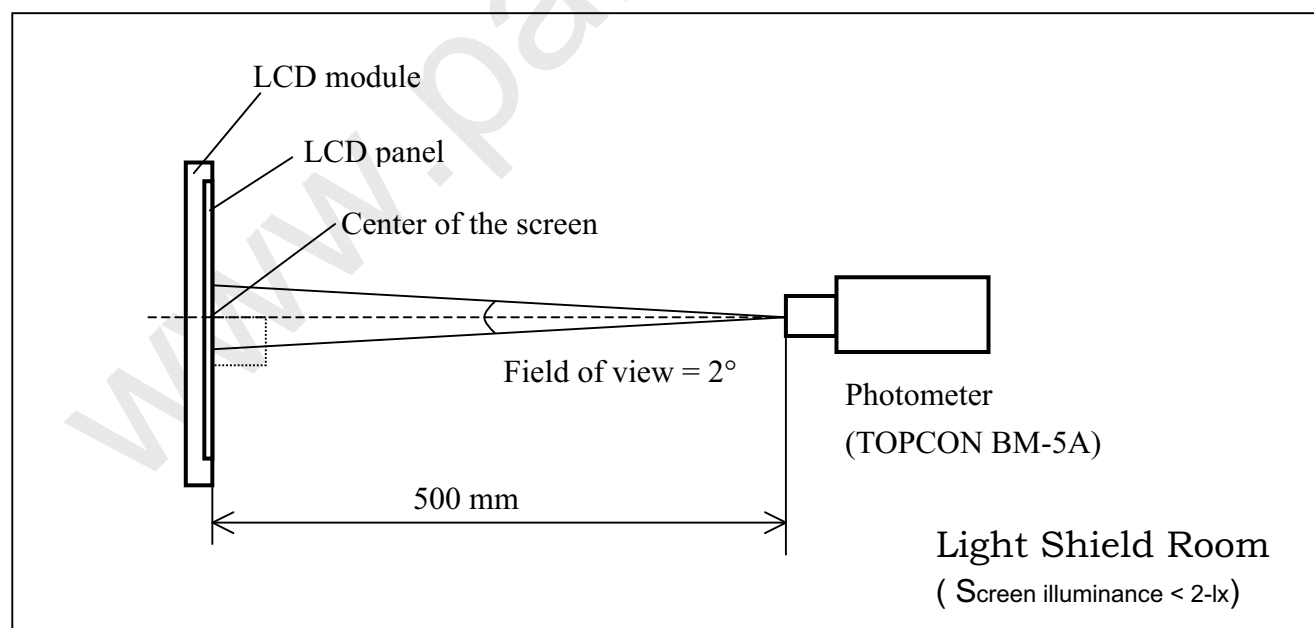
$Y_A$  = Luminance of measured location without darkest gray pattern ( $cd/m^2$ )

$Y_B$  = Luminance of measured location with darkest gray pattern ( $cd/m^2$ )



Note (6) Measuring setup :

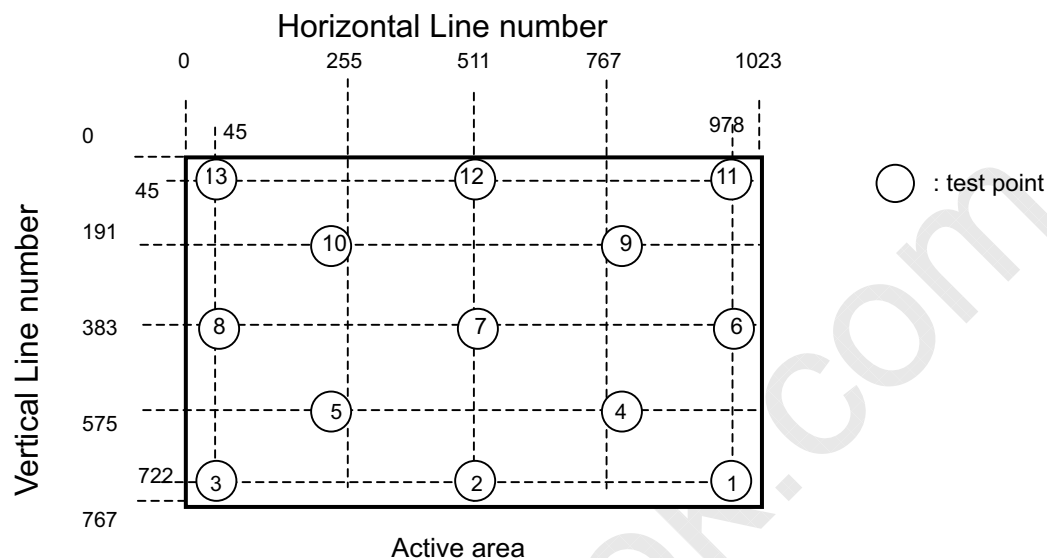
The measurement suppose to be executed after stabilized the panel at given temperature during 30min. in the case of abrupt temperature change. The measurement shall be executed 30 minutes after lighting at rating. The luminance of white should be typical luminance ( Typical Condition IL=6.0mA ). In order to stable the luminance, LCD shall not be gotten winds.



Note (7) Definition of 13 points white variation  $\delta W$ , CR variation  $\delta C_R$

$\delta W$  = Maximum luminance of 13 points / Minimum luminance of 13 points

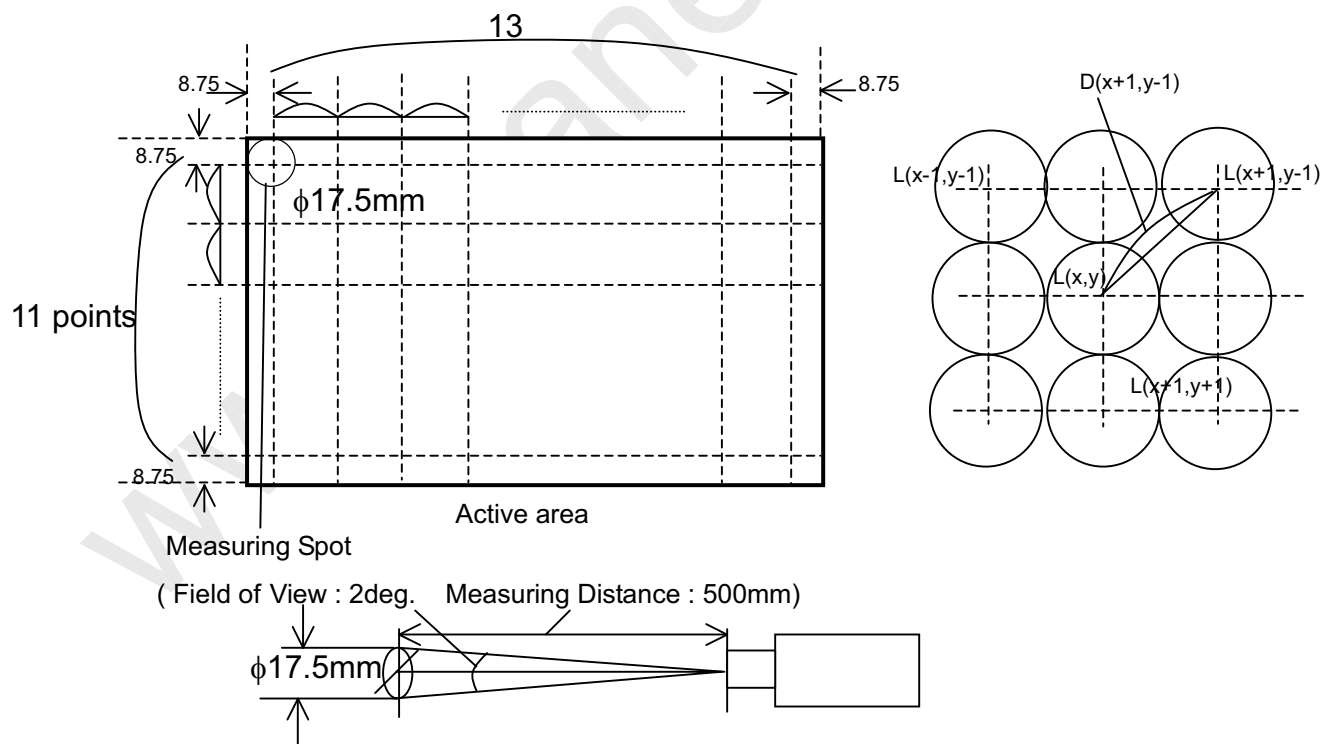
$\delta C_R$  = Maximum CR 13 points / Minimum CR of 13 points



Note (8) Definition of White Variation  $dL$  : measure the luminance of white at  $13 \times 11$  points.

$$dL = |L(x,y) - L(x+l, y+j)| / (L(x,y) \times D(x+l, y+j)) \times 100 \quad (\%/mm)$$

where  $2 \leq x \leq 12$ ,  $2 \leq y \leq 10$ ,  $l = \pm 1$ ,  $j = \pm 1$





## 5. MECHANICAL DRAWING

Please refer to the attached drawings.

## 6. PRECAUTION

### 6. 1 ASSEMBLY AND HANDLING PRECAUTION

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latchup.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

### 6.2 SAFTY PRECAUTION

- (1) The startup voltage of backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

## 7. PACKAGING

### 7.1 PACKING SPECIFICATIONS

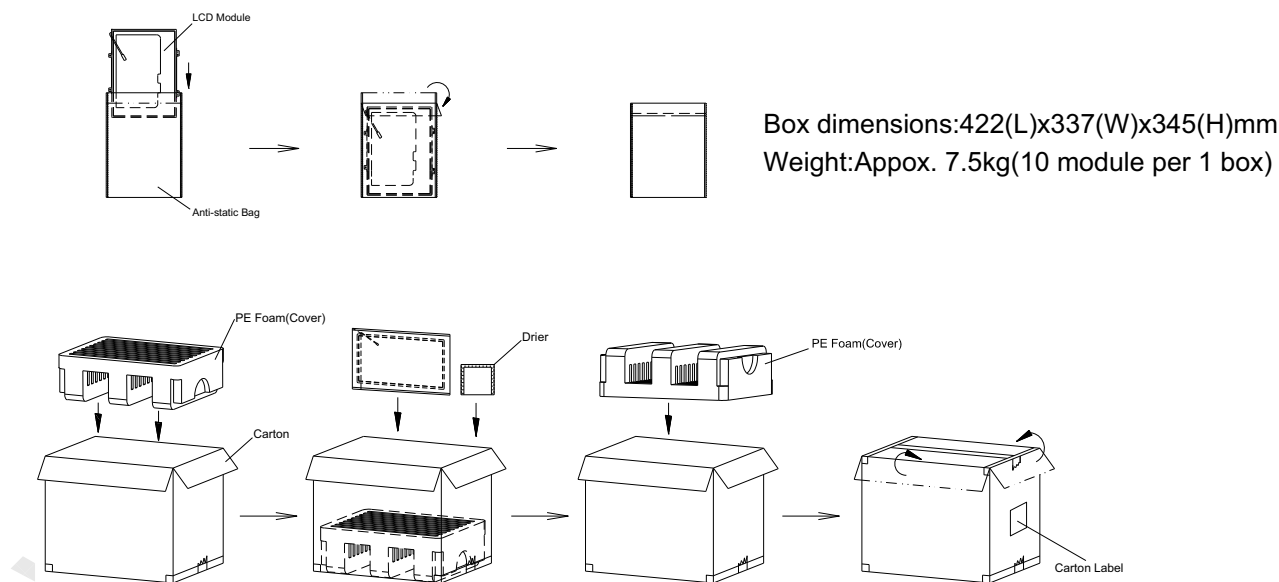
- (1) 10 LCD modules / 1 Box
- (2) Box dimensions : 422(L) X 337(W) X 345(H) mm
- (3) Weight : approximately 7.5Kg (10 modules per box)

### 7.2 PACKING METHOD

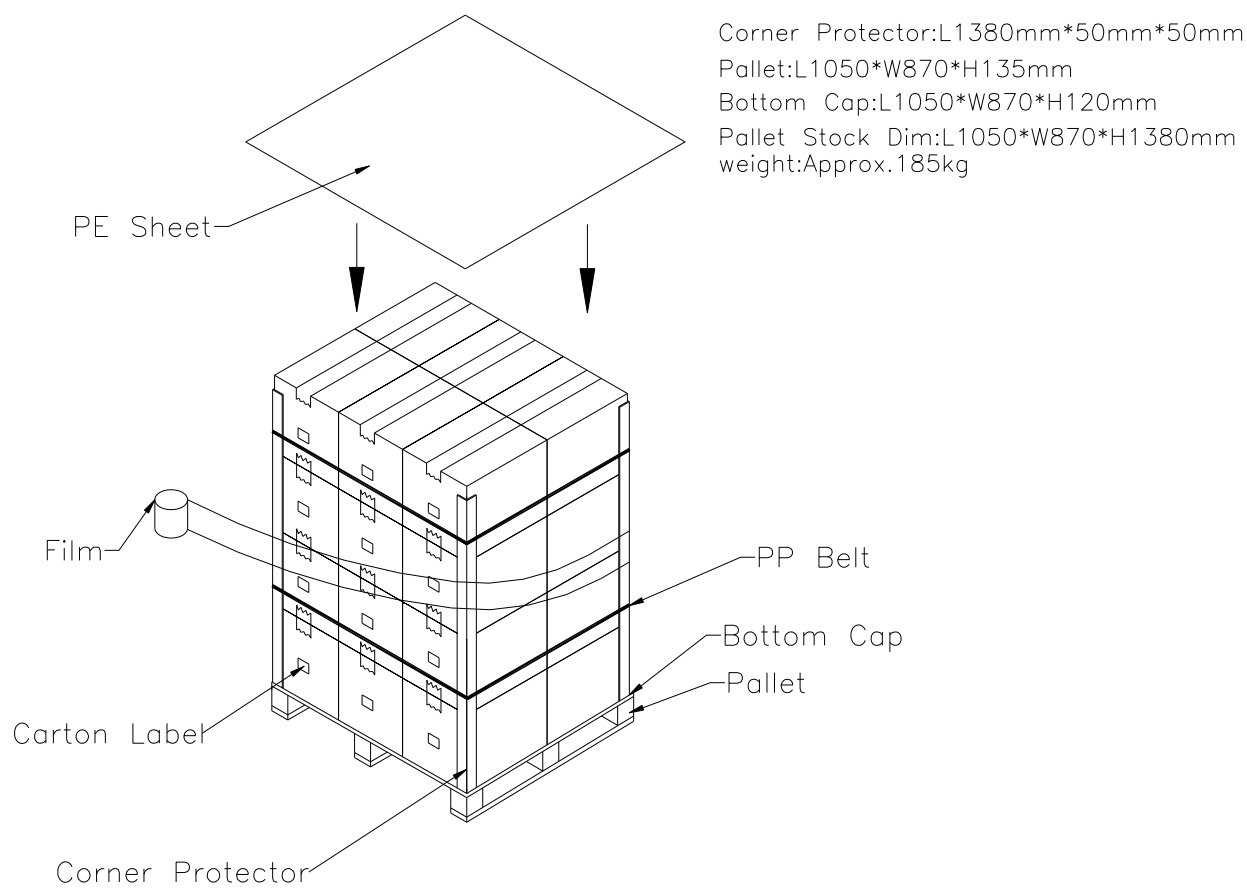
- (1) Carton Packing should have no failure in the following reliability test items.

| Test Item     | Test Conditions                                                                                                                                                                    | Note          |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Vibration     | Frequency Range: 5 – 50 Hz, Degree of acceleration 9.8 m/s <sup>2</sup> (1G).<br>Sweep rate 3 minutes<br>Top & Bottom 60 minutes, Right & Left 15 minutes, Back & Forth 15 minutes | Non Operation |
| Dropping Test | 1 Angle, 3 Edge, 6 Face, 60cm                                                                                                                                                      | Non Operation |

- (2) The Figure. 7-1,2 show the packing method.



**Figure. 7-1 Packing method (Carton)**

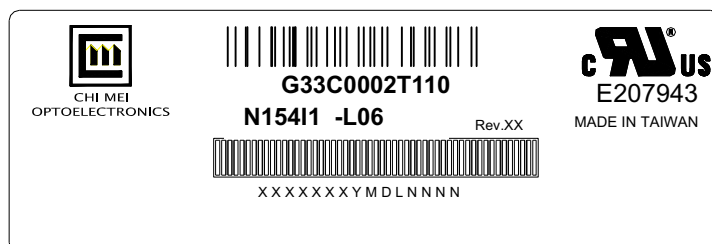


**Figure. 7-2 Packing method (Pallet)**

## 8. DEFINITION OF SHIPPING LABEL ON MODULE

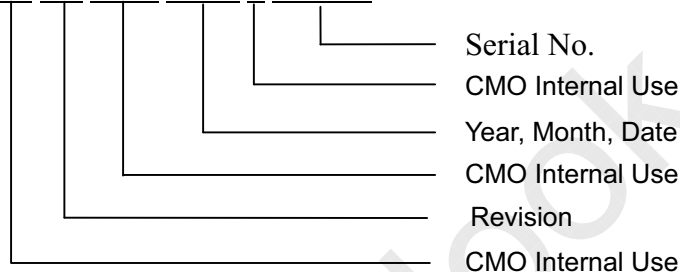
### (1) CMO Label

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(70mm x 24mm)

- (a) Model Name: N154I1 - L06
- (b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (c) Serial ID: X X X X X X Y M D X N N N N



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 1~9, for 2001~2009  
 Month: 1~9, A~C, for Jan. ~ Dec.  
 Day: 1~9, A~Y, for 1<sup>st</sup> to 31<sup>st</sup>, exclude I , O and U
- (b) Revision Code: cover all the change
- (c) Serial No.: Manufacturing sequence of product



Issued Date: Apr.20, 2005

Model No. : N154I1-L06

**Approval**

## (2) Carton Label

CHI MEI OPTOELECTRONICS

PO.NO. \_\_\_\_\_

Part ID. G33C0002T110

Model Name \_\_\_\_\_

Carton ID. \_\_\_\_\_ Quantities \_\_\_\_\_

## (3) Pallet Label

CHI MEI OPTOELECTRONICS

Product code: G33C0002T110

PO number: \_\_\_\_\_

Quantity: \_\_\_\_\_

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! [www.panelook.com](http://www.panelook.com)